

# DIAGNOSTIC ACCURACY OF ULTRASOUND IN DIAGNOSIS OF INTUSSUSCEPTION IN CHILDREN CONSIDERING SURGICAL FINDINGS AS GOLD STANDARD

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## ABSTRACT

**INTRODUCTION:** Intussusception is one of the most common causes of intestinal obstruction in infants and small children. Intussusception is basically a childhood disease with peak incidence between 6 months and 2 years but can also occur in older children. Since intussusception requires a specific treatment, prompt identification is essential. Ultrasound is quick to perform, is non-invasive, does not involve radiation exposure, is cost effective, is easily available everywhere and is not discomforting to the young patient. The rationale of this study was to form a non-invasive easily available modality to diagnose intussusception in children so that timely intervention could be done to reduce morbidity and mortality. **MATERIALS AND METHODS:** The study was conducted in Department of Radiology, Khyber Teaching Hospital Peshawar from December 2020 to January 2022. We collected total of 251 patients with age range in between 6 months to 5 years. Patients having compatible symptoms like blood in stool and pain abdomen were evaluated by ultrasound by an experienced radiologist. Patients were closely followed to know their true positive and true negative status by either radiological or surgical. SPSS was used for data entry and analysis. **RESULTS:** The mean age of the sample was 2.9 – 1.4 years. Sensitivity of US was found to be 94.8% and specificity 71.2%. The positive predictive value of the US was 86.1% and negative predictive value is 88.1%. **CONCLUSION:** Ultrasound is useful diagnostic tool and has an acceptable sensitivity and specificity for the detection of intussusception.

**Key Words:** Ultrasound; Children; intussusception.

## Introduction

Intussusception is one of the most common causes of intestinal obstruction in infants and small children.<sup>1</sup> It leads to edematous swelling of the intestinal segment and this swelling jeopardizes the blood supply leading to ischemia and eventual gangrene of the telescoping segment.<sup>2</sup> Gangrenous part then perforated and causes generalized peritonitis.<sup>3</sup> Intussusception if not diagnosed and treated early can lead

to death of the patient.<sup>4,5</sup> Intussusception is basically a childhood disease with peak incidence between 6 months and 2 years but can also occur in older children.<sup>6,7</sup> Prevalence is usually between 7 to 8 percent with compatible symptoms.<sup>8</sup> In 90% of the cases it is idiopathic i.e. no cause is known. Secondary intussusception can be due to any one of multiple causes such as Meckel s diverticulum or tumor.<sup>9,10</sup>

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Since intussusception requires a specific treatment,<sup>11</sup> prompt identification is essential. Currently ultrasound has proven to be a highly accurate method of diagnosing intussusception with both high sensitivity (83.9%)<sup>1</sup> and specificity (95.7%).<sup>1</sup> It has replaced barium enema as a diagnostic investigation of choice. Ultrasound is quick to perform, is non-invasive, does not involve radiation exposure, is cost effective, is easily available everywhere and is not discomforting to the young patient. It can also exclude other causes of intestinal obstruction and can identify pathological lead point in intussusception if one is present. Color Doppler can detect gut wall ischemia and thus guides treatment.

The rationale of this study was to form a non-invasive easily available modality to diagnose intussusception in children so that timely intervention could be done to reduce morbidity and mortality. This study also aims to highlight the diagnostic accuracy of ultrasound in early detection of acute intussusception so that it can be used as initial investigation. It will improve the safety profile and is cost-effective, as it is fast, reliable and operationally efficient so early detection of intussusception will become possible.

## Materials and Methods

The study was conducted in Department of Radiology, Khyber Teaching Hospital Peshawar from December 2020 to January 2022. It was duly approved by ethical review committee. We collected total of 251 patients with age range in between 6 months to 5 years. Patients unfit for surgery and those who had done previous abdominal surgery for any other disease were excluded. Patients having compatible symptoms like blood in stool and pain abdomen were first seen by physician in pediatric emergency ward Khyber Teaching Hospital and then referred to Radiology Department Khyber Teaching Hospital for evaluation with ultrasound by an experienced radiologist. Informed consent was obtained and abdomen was evaluated by following standard protocol using Toshiba xario 100 ultrasound machine and specific transducer. Results were interpreted as positive and negative for intussusception. Patients were closely followed to know their true positive and true negative status by

either radiological or surgical. The data was entered and analyzed using Statistical Package for Social Sciences (SPSS) version 17. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of ultrasound was calculated keeping surgical findings as gold standard using 2 2 table.

## Results

The study was conducted on 210 patients suspected for intussusception. The mean age of the sample was 2.9 – 1.4 years. Minimum age of 0.5 years and maximum age of 5 years. While distributing the patients with regards to gender, we observed that in our study 59% of the sample was male and 41% were female gender. On US, intussusception was observed in 71.9% of patients (Tab.1) while on follow up surgery, intussusception was recorded in 65.2% of patients (Tab.2). Sensitivity of US was found to be 94.8% and specificity 71.2%. The positive predictive value of the US was 86.1% and negative predictive value is 88.1%. (Tab.3)

Intussusception on US	Frequency	Percent
Positive	151	71.9
Negative	59	28.1
Total	210	100.0

Table 1: Frequency of intussusception on US (n=210)

Intussusception on US	Frequency	Percent
Positive	137	65.2
Negative	73	34.8
Total	210	100.0

Table 2: Frequency of intussusception on surgery (n=210)

Intussusception on US	Intussusception on Surgery		Total
	Positive	Negative	
Positive	130	21	151
Negative	7	52	59
Total	137	73	210

Sensitivity of US: TP/TP + FN = 94.8%  
 Specificity of US: TN/TN + FP = 71.2%  
 Positive Predictive Value US: TP/TP + FP = 86.1%  
 Negative Predictive Value US: TN/TN + FN = 88.1%  
 Accuracy: TP + TN / n = 86.7%

Table 3: US and surgery 2x2 table (n = 210)

## Discussion

Intussusception is most commonly encountered in children and has been reported to be the most common abdominal emergency in early childhood and the second most common cause of intestinal obstruction after pyloric stenosis.<sup>12</sup> The mean age of intussusception in children is 6 to 18 months, with a male predominance. The incidence of intussusception declines with age - only 30% of all cases occur in children older than 2 years. Ileocolic intussusception is the most common form of intussusception in children. The etiology of pediatric intussusception is usually idiopathic, with only 10% of cases having an identifiable precipitating lesion.<sup>13</sup>

Infectious etiology resulting in mesenteric lymphadenopathy is another common cause of pediatric intussusception. Hypertrophy of the Peyer patches in the setting of common viral illness such as adenovirus and rotavirus can lead to intussusception.

The clinical presentation of intussusception is variable but generally marked by abdominal pain and signs of bowel obstruction. In the pediatric population, it is one of the most common abdominal emergencies. Children younger than 2 years classically present with acute onset colicky abdominal pain, knees drawn to chest, with excessive irritability and crying. The child may return to their usual level of activity between bouts, or they may appear listless and lethargic as the pain becomes progressively more intense. Shortly after the onset of pain, vomiting may occur. Nearly half of cases progress to stool mixed with blood and mucus, giving it a currant jelly appearance. Physical exam may reveal a palpable sausage-shaped mass in the right upper quadrant or epigastric region of the abdomen, but the mass is only detected in approximately 60% of cases. The classic pediatric triad of abdominal pain, palpable abdominal mass, and bloody stool is quite rare, present in less than 15% of cases.<sup>14</sup> Due to the noninvasive nature of ultrasound, it is the imaging modality of choice for evaluating children, and has been found to be a rapid, sensitive screening procedure in the assessment for intussusception. Limitations to ultrasound accuracy include massive air in cases of bowel distension or morbid obesity, both of which can result in a decreased rate of detection and diagnosis of intussusception.<sup>15</sup>

The results of the study showed that US was highly accurate in the diagnosis of intussusception in experienced hands with a sensitivity of 94.8%. The accuracy of US diagnosis in experienced hands was high and could increase the diagnostic confidence in patients with suspected intussusceptions. However, in the developing countries, operative treatment may sometimes be expedient in averting grave consequences of the condition, which could be occasioned by poverty or non-availability of the required non-operative modality of treatment.


## Conclusion

US has an acceptable sensitivity and specificity for the detection of intussusception. As such, it is a useful radiological tool for diagnosis of intussusception in infants and young children and further studies are recommended to confirm its usefulness.

**Conflict of Interest:** None

## References

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